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(71) Applicant
Kabushiki Kaisha Toshiba

(Incorporated in Japan)

72 Horikawa-cho, Saiwai-ku, Kawasaki-shi, Kanagawa-ken, Japan

(72) Inventor
Yoshiaki Matsuno

(74) Agent and/or Address for Service
Batchellor, Kirk & Eyles,
2 Pear Tree Court, Farringdon Road, London EC1R 0DS

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(54) Supply meter

(57) A supply meter, e.g. for electic power, includes a count indicator (14) for indicating the output signal of a frequency divider (12) which divides the pulsed output signal of a power to frequency converter (11), and an indicator (15) having both a source of visible light (16) and a source of invisible radiation (17). The visible light source (16) is energised by a divided signal (13) from the frequency converter to produce flashing at a visually discriminate frequency, while the source of invisible radiation (17) is energised at a higher pulse-rate by the output signal of the frequency converter itself, or by a divided signal of the frequency converter, to produce radiation pulses detectable by an invisible ray detector. The meter may be adapted to measure gas, water, etc.

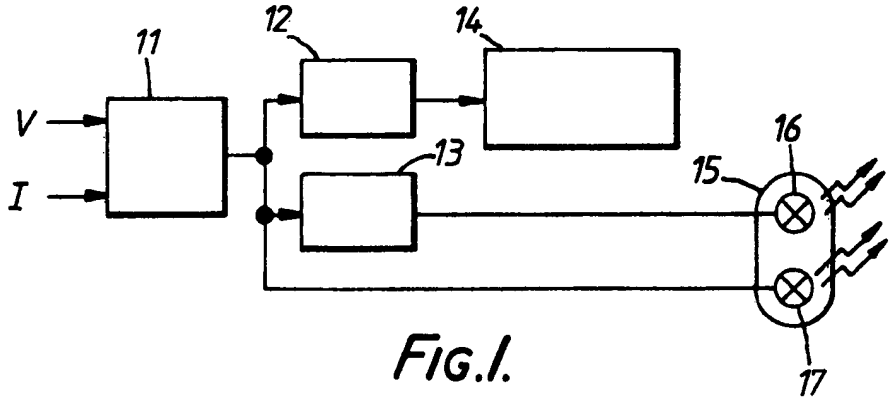

FIG.1.

GB 2 177 805 A

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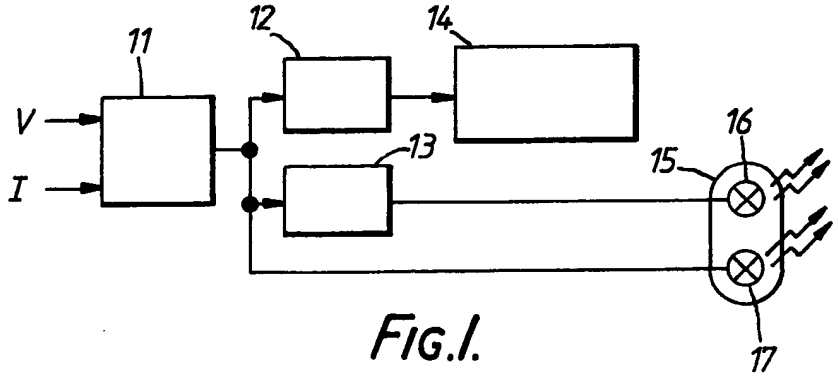

FIG.1.

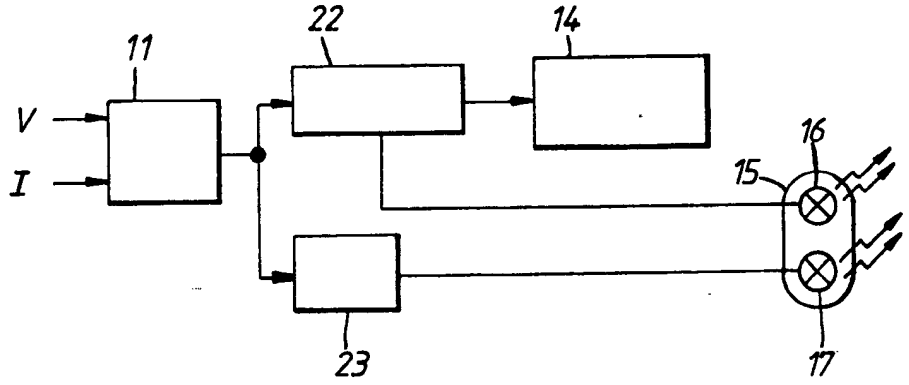

FIG.2.

SPECIFICATION

Supply meter

This invention relates to a supply meter for measuring a utility, such as electricity, gas, water, and the like.

In a conventional electronic-type watt-hour meter, a power-frequency converter converts electric power, detected from a load voltage V and a load current I, into a pulsed output having a frequency proportional to power. Two frequency dividers are connected to receive the output of the converter. One of the dividers weighs the output from the converter, that is, it defines the electrical power per pulse, and then a count indicator counts the pulses of the output signal of the frequency divider and indicates the count in terms of watt-hours. The other frequency divider divides the output of the converter into a low frequency which is supplied to a visible light source, such as a light emitting diode, which causes it to flash at a rate which canbe distinguished by the human eye. This confirms the operation of the watt-hour meter.

The amount of electric power measured by the meter can be measured by counting the number of flashes of the light emitting source in a fixed time interval. However, a disadvantage of this electronic-type watt-hour meter is that accurate testing of the meterby detecting the number of flashes would take a time period approaching that required to test an induction-type watt-hour meter, thus losing one of the advantages of the electronic-type watt-hour meter.

It has been proposed to supply the visible light source directly from the converter, but it has been found that the amount of power consumed cannot be determined because the light source flashes at a fast rate which cannot be discriminated by the human eye.

It has also been proposed to provide an electronic watt-hour meter with an external test terminal in addition to the visible light source. The output of the power-frequency converter is connected to the test terminal so that a reduced testing period can be achieved by taking pulses at high frequency from the test terminal. However, this results in a more complex construction and, hence, expense.

An object of the present invention is to provide a supply meter which can have its performance visually confirmed without specifically providing a test terminal.

According to the present invention, a supply meter comprises a converter for detecting the quantity of a utility and providing a pulsed output with a frequency proportional thereto; a frequency divider for dividing the frequency of the output of the converter; a count indicator for counting the output of the frequency divider and indicating the quantity of the utility; and an indicator having a source of visible light energisable by a signal which is a divided output from the frequency converter and has a visually discriminatable frequency, and having a source of invisible radiation energisable at a frequency detectable by an invisible ray detector by either the output signal of the frequency converter or by a divided signal from the converter.

In order that the invention may be more readily understood, it will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a block diagram illustrating an electronic-type watt-hour meter embodying the present invention; and

Figure 2 is a block diagram illustrating a modification of the electronic-type watt-hour meter according to the present invention.

Referring to Figure 1, the electronic-type watt-hour meter comprises a power-frequency converter 11 for converting electric power, detected from a load voltage V and a load curent I, into a frequency, a first frequency divider 12 for dividing the output of the power-frequency converter 11, a count indicator 14 for counting the output signal of the frequency divider 12 and for indicating it in terms of watt-hours, a second frequency divider 13 connected to the output of the power-frequency converter 11 in parallel with the first frequency divider 12 for dividing the output of the power-frequency converter 11 to a low frequency that a light source flashing at that frequency can be discriminated by the human eye and an indicator 15 which has a source of visible light 16 connected to the output of the second frequency divider 13 and a source of invisible radiation 17 connected to the output of the power-frequency converter 11.

The light source 16 and the source of radiation 17 may comprise a light emitting diode, for example, a green light emitting diode and an infra-red emitting diode, respectively.

In this embodiment, a load voltage V and a load current I are inputted to the power-frequency converter 11 where a signal representing electric power is produced by a multiplication operation and is converted into pulses, namely, a frequency signal proportional to the electric power. Then, the frequency signal is inputted into the frequency divider 12 and its output is indicated by the count indicator 14.

Since the light source 16 of the indicator 15 produces flashes of light in response to the output signal of the frequency divider 13, the indicator 15 functions as a performance indicator so that the amount of electric energy consumed by the load can be indicated by the flashing output of the light source 16. Since the source of radiation 17 produces pulses of radiation in response to the output signal of the power-frequency converter 11, fast testing of the apparatus can take place by placing at the front of the indicator 15 a detector which

can detect the invisible radiation. Further, because it is not necessary to provide specially a testing terminal, an increase in the size of the terminal unit and of the cost of the supply meter can be avoided.

Figure 2 illustrates an alternative embodiment of the invention in which an additional output of the frequency divider 22, which divider divides the output signal of the power-frequency converter 11 and outputs a signal to the count indicator 14, is used as the signal which is applied to the source of visible light 16, and also in that a frequency divider 23 , which divides the frequency by a factor of two, is positioned between the power-frequency converter 11 and the source of invisible radiation 17.

The electronic-type watt-hour meter of this embodiment is effective in the case where there is a danger that the radiation flashes of the invisible radiation source 17 cannot be detected by the invisible ray detector due to the short pulse length of the output signal of the power-frequency converter 11. The frequency dividing unit 23 is not limited to a frequency divider which divides by a factor of two but may be an alternative frequency dividing unit which divides the output of the power-frequency converter 11 into any frequency which is detectable by the invisible ray detector.

Alternatively, the input to the source 17 may be derived from the frequency divider 22 upstream of the output from the divider to the light source 16. In other words, the frequency of the signal applied to the source 17 is greater than that applied to the source 16.

Thus, according to the present invention, the indicator has a light source which is energised by a signal from the frequency converter which is of such a frequency that a light source flashed at that frequency can be perceived by the human eye, and also a source of invisible radiation which is energised so as to be detectable by an invisible ray detector either by a signal from the converter or by a signal divided therefrom. It is, therefore, possible not only to confirm the operation of the supply meter by the flashing of the light source, but also to determine the amount of consumed electric power by utilising this flashing light. Further, because the source of invisible radiation produces fast pulses of the radiation, fast testing of the supply meter can be achieved by providing the indicator with an invisible ray detector.

The embodiments described above in connection with Figures 1 and 2 are only examples in that the invention is described as applied to an electronic-type watt-hour meter, but it should be noted that the present invention may be applied to meters for gas, water, and the like.

CLAIMS

1. A supply meter comprising a converter for detecting the quantity of a utility and providing a pulsed output with a frequency proportional thereto;

a frequency divider for dividing the frequency of the output of the converter;

a count indicator for counting the output of the frequency divider and indicating the quantity of the utility; and

an indicator having a source of visible light energisable by a signal which is a divided output from the frequency converter and has a visually discriminatable frequency, and having a source of invisible radiation energisable at a frequency detectable by an invisible ray detector by either the output signal of the frequency converter or by a divided signal from the converter.

2. A supply meter as claimed in claim 1, in which the source of visible light is energisable by an output signal from a second frequency divider which receives the output signal of the frequency converter as its input.

3. A supply meter as claimed in claim 2, in which the second frequency divider is a part of the first-mentioned frequency divider.

4. A supply meter as claimed in any preceding claim, in which the source of visible light is a light emitting diode.

5. A supply meter as claimed in any preceding claim, in which the source of invisible radiation is an infra-red emitting diode.

6. A supply meter as claimed in any preceding claim, in which the frequency converter detects electric power from a load voltage and a load current and converts the power to a frequency proportional thereto.

7. A supply meter substantially as hereinbefore described with reference to the accompanying drawing.

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